Forest Insect Laboratory
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FOREST INSECT SURVEYS

MODOC NATIONAL FOREST, CALIFORNIA

SEASON OF 1935

(Including the 14th Annual Report

of the

Happy Camp-Lava Beds Area)

Approved by:

J. M. MILLER
Senior Entomologist, in Charge

Submitted by:

Philip C. Johnson
Junior Forester

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FOREST INSECT SURVEYS - MODOC NATIONAL FOREST, CALIFORNIA

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INTRODUCTION

The 1935 survey of forest insect conditions on the Modoc National Forest was conducted by the Bureau of Entomology and Plant Quarantine from May until September. The field work was made up of several activities which included the cruising of permanent sample plots, reconnaissance, surveys, studies of the composition of insect species in infested trees, and of life histories. Attention was also given to cooperative work on salvage logging operations. As a result of this field program, ample opportunity was provided to follow the development of the 1935 infestation.

Qualitative features of the infestation have been closely followed throughout the season by means of stem analyses of infested trees. This was made possible by the cooperation of the Civilian Conservation Corps camp at Hackamore and of the McCloud River Lumber Company on their White Horse salvage operation.

The formal survey included the cruising of sixteen 320-acre permanent sample plots. The plot loss records for 1934 were completed and approximately 60 to 85 percent of the estimated 1935 loss was cruised.

GENERAL INFESTATION CONDITIONS

Characteristics:

Losses caused by the 1935 infestation appeared with such rapidity early in the season that by midsummer there were indications that the total losses for the year would exceed the heavy loss of 1934. Large groups of infested trees (fig. 1 and 2) were evident throughout most of the Modoc plateau region, most of these groups being the result of attacks by the first seasonal generation of the western pine beetle. Grouping continued to a less extent over most of the area as a result of attacks by the second generation of the beetle. Few groups were infested by attacks of the third generation. The tendency toward such grouping has usually occurred during the peaks of infestation cycles. That such a peak occurred before midsummer was indicated by the marked decrease in the number of fall attacks and by the absence of grouping in these attacks.

The decrease in the winter generation of the beetles has apparently brought the estimated seasonal loss for 1935 below the previous year's figure. This is shown in the following table:

TABLE I

Board Foot Loss Per Acre

Unit	1933	1934	1935
Glass Mountain	305	277	210
Badger	171	402	331
Happy Camp	196	401	281
Lava Beds	305	317	173
Pit River	85	130	151
Buck Creek	133	258	141
AVERAGE	199	297	215

An examination of Badger township late in October disclosed a marked reduction in the number of 1935-winter trees. Since that time low temperatures should have prevented any considerable amount of new infestation.

During 1935 infestation centers occurred near Sugar Pine Ridge, at Mud Spring east of Hollenbeck Flat, and at Hackamore. The 1935 loss in the former area was exceptionally heavy as is shown by the plot (RS-2) loss in Table II. The infestation centers mentioned above are more or less connected by a belt of heavy losses which skirts the lava beds and fringe type stands.

Losses for 1935 in the fringe areas are less, particularly in the north part of the Glass Mountain Unit and in the area northwest of Hackamore. However, the fringe areas adjacent to Howitz Butte showed an increase of approximately 15 percent over the 1934 loss.

The lava beds showed a decrease of 45 percent in the 1935 loss and the area as a whole presents a rather clean appearance. A few localized centers of heavy infestation were found in the vicinity of Quaking Asp but these were not common.

The Pit River Unit is the only area to show an increase in current losses for the unit as a whole.

Among the areas covered by the survey, the Buck Creek Unit in the north Warner Mountains presents by far the cleanest appearance. A great reduction in 1935 losses was apparently brought about by the combination of an effective insect control program last winter and the better growth conditions on most of the unit.

A comparison of plot and unit losses is shown in Tables II and III and in the accompanying graph.

A characteristic of the 1935 infestation was the prevalence of attacks in the younger thriftier trees. The majority of trees which occurred in the infested groups were of intermediate diameter classes. This condition was uniform over most of the Modoc and can be attributed mainly to the epidemic situation prevailing.

The fringe area of the Glass Mountain Unit was also marked by a

preponderance of thrifty trees in the infestation. The cause in this case, however, was of a different nature. Continued heavy losses in this area in the past decade have removed most of the less thrifty types which were more susceptible to insect attacks. The stand remaining today is largely composed of thrifty individuals which ordinarily are able to resist insect attacks. That the bulk of the 1935 losses in this area is made up of this type (figs. 3 and 4) is probably due not so much to the trend of the infestation as it is to the fact that the more susceptible types are lacking. There is also the possibility that the remaining trees may not be as thrifty as their crown class would indicate, owing to critical environmental influences.

Composition:

A study was made in conjunction with the 1935 survey for the purpose of sampling the insect composition of the infestation. This was accomplished by felling a large number of brood trees and analyzing the infestation along the entire length of the boles. Falling crews supplied by the CCC camp at Hackamore for the study in July, and again in November, aided materially in securing a sufficient number of samples. The composition of the 1934-winter infestation was determined by sampling 84 infested trees and that of the 1935 infestation by making 108 analyses. The western pine beetle was by far the most important factor in ponderosa pine losses during the winter of 1934 and summer of 1935. Next in importance was the Oregon engraver beetle, a species frequenting the tops of infested trees, and the California pine flat-headed borer. The latter species, usually an important factor in the infestation in this area, was less active during 1935 than at any time during the past three or four years.

The composition of the average tree infested in 1935 was also less complex than in those of the preceding years. A heavy western pine beetle attack occupied the bole from the base to a top diameter of approximately 12 inches. The top was, in most cases, infested by the Oregon engraver beetle. Because of this, the spotters engaged in the survey were able to determine the primary species responsible for the death of the tree in approximately 75 percent of the trees marked. Normally, this is only possible in about 25 percent* of the trees marked. The lower figure is largely due to the prevalence of mixed infestations and the tendency of secondary insect species to fill in the basal portion of the trees in lieu of the primary species which, in many cases, do not occur within reach of the spotter.

Seasonal History:

Seasonal history studies were carried on at the Hackamore Field Laboratory from March to November of 1935. The proved of decided value in

* Salman, K. A. "Regional Surveys Report #1 - Composition of Forest Insect Infestations in Ponderosa Pine as Determined by Stem Analyses." Mss. report of the Bureau of Entomology and Plant Quarantine, Berkeley, California. March 30, 1935

correlating brood development with the quantitative results from the survey. New attacks resulting from the emergence of 1934 overwintering broods of the western pine beetle occurred during the first half of June. The first 1935 generation was very heavy throughout most of the area as was the second generation, attacks of which occurred early in August. A portion of the second generation emerged later in the season, and attacks resulting from this emergence formed the basis of the third generation. The overwintering population is composed of a portion of the second and third generations, the former in the form of large larvae and the latter as eggs and small larvae. A similar condition occurred in the winter of 1934-35.

Loss in White Fir:

General observations in the Modoc area disclosed heavy insect losses in white fir wherever this species occurred in the stand. Losses were particularly noticeable in the North Warner District and on the north slopes of Happy Camp Mountain. Much of the loss occurs as topkilling, though many trees are completely infested. The fir engraver beetle, Scolytus ventralis Lec., is largely responsible for both types of injury in this and other California areas.

EFFECTS OF 1934-35 INSECT CONTROL PROGRAM

The 1934-35 Buck Creek Insect Control Project was the only direct control program carried out on the Forest in the current year. The project was begun in December, 1934, but owing to unsatisfactory weather conditions, was not completed until the following March. A regional survey plot located within the boundaries of the treated area served as a means of checking the results of the project.

Insect losses during 1934 prior to control amounted to 144 trees per section with a volume of 164,860 board feet. This represented an increase of 94 percent over the 1933 loss. A cruise of the plot made in August of 1935 showed that a decided drop in the infestation had occurred; this in comparison to other Modoc areas which were sustaining peak epidemics during the same period. The estimated per-section loss for 1935 of 55 trees with a volume of 90,500 board feet is a reduction of 45 percent.

SALVAGE CUTTING

A salvage cutting operation of the McCloud River Lumber Company was in progress throughout most of the summer of 1935 in the area lying between Round Mountain and Hole-in-the-Rock. The Bureau's interest in the project was twofold; that of collecting data for use in determining the effectiveness of this type of cutting, and that of serving as an advisory agency for the entomological difficulties that arose from time to time. A 320-acre sample plot (MC-10) was established during the early stages of the project. The plot was cruised late in May at the time of cutting, and again in September. A check plot (RS-6) of 320 acres adjoining the salvage area and of similar type was cruised at approximately the same time. The 1935-summer loss on each plot is shown as follows:

	Salvage Plot MC-10		Check Plot RS-6		
	Trees	Volume	Trees	Volume	Remarks
Total Seasonal Loss - 1934	57	67,570	71	57,920	
Infested Trees Marked 5/28/35	10	18,680			Before Salvage
" " " 8/16/35			23	23,610	After Salvage
" " " 9/ 9/35	9	8,300			After Salvage

The loss on the salvage plot which occurred in the period between May 29, or the time of cutting, and September 9, was only 35 percent of that occurring on the check plot up to August 16. While it is too early to predict the effect of the salvage cutting, the differential already established between the two plots may become significant if extended and amplified during the coming year.

INSECT CONTROL POSSIBILITIES

An examination of the infestation made in November of 1935 indicated that a decline in the overwintering barkbeetle broods was in progress. This may be reflected in a decrease in losses during 1936, though fulfillment of this prediction will depend largely upon climatic and other environmental factors. Any reduction likely to occur will probably result in a loss far in excess of the annual increment in most of the Modoc stands.

The difficulties of applying direct control measures and in establishing a permanent control with certain types of infestation that have been present on most of the area has been brought out in previous survey reports. It appears evident that drastic changes in the forest conditions are occurring as a result of the unfavorable environment. Much of the timber is becoming submarginal and definite indications of a recession of the timber line are present in many fringe areas. Direct control methods which have been used in the past on the Modoc appear to be of doubtful value under such conditions.

The Buck Creek Unit in the northern part of the Warner Mountains is not subject to as acute conditions and thus far, direct control has shown beneficial results. The control project of last winter created a reduction in the infestation which eliminates this from any consideration of immediate control.

The experience gained during the past summer with salvage cuttings on the Modoc and Lassen National Forests lends encouragement to this method as one of the few practical solutions of utilizing pine beetle losses in eastside stands under prevailing conditions. To date, we know that the plan is feasible in the woods under proper infestation conditions, that there are salvageable values in the infested logs sent to the mill, that it can be easily adapted to accepted silvical methods and management plans. There are some indications, though slight at the present time, that the beetle population may be diminished to the extent that a reduction in the succeeding infestation may result. The remaining stand would probably be left in better condition to resist further insect depredations. It is

hoped that further studies will be made to establish the value of this method of utilization of insect losses and its subsequent effect upon the infestation.

SUMMARY

The 1935 survey disclosed the following salient features in connection with barkbeetle conditions on the Modoc National Forest:

1. A peak in the infestation cycle was reached during the summer of 1935 though the reduction in fall attacks brought the total loss for the year below that of 1934 over most of the area.

2. Centers of heavy infestation existed on Sugar Pine Ridge, at Mud Spring near Hollenbeck Flat, and at Hackamore.

3. The increase in the activities of the western pine beetle resulted in a more uniform composition in the infestation.

4. The 1935 infestation was accompanied by heavy grouping of infested trees in the early summer.

5. The 1934-35 Buck Creek Insect Control Project was apparently successful if judged by the reduction in infestation which followed.

6. The salvage logging program near Pound Mountain appeared to have some effect to date on the course of the infestation though this cannot be definitely established until further study has been made.

TABLE II

PLOT LOSSES - MODOC NATIONAL FOREST

PER SECTION BASIS

Plot	1933			1934				1935			
	Trees	B.M. Volume	B.M. per Acre	Trees	B.M. Volume	B.M. per Acre	% 1933 Infest.	Trees	B.M. Volume	B.M. per Acre	% 1934 Infestation
RS-1	178	140,660	220	378	324,960	508	230.9	437	301,233	471	92.7
RS-2	122	123,320	193	336	321,600	503	260.6	571	393,947	616	122.5
RS-3	82	81,120	127	224	213,580	332	261.4	133	94,960	148	44.6
RS-4	608	346,240	541	586	299,600	468	86.5	286	163,413	255	54.5
RS-5	86	81,120	127*	220	164,340	257	202.4	265	174,523	273	106.2
RS-6	92	119,200	186	142	115,840	181	97.3	102	104,933	164	90.6
RS-11	100	85,100	133	144	164,860	258	194.0	55	90,500	141	54.7
MC-1	122	81,400	127	188	125,100	195	153.5	264	144,613	226	115.9
MC-2	142	113,020	177	322	252,600	395	223.2	300	225,400	349	88.4
MC-3	1933 Control Data Missing			612	624,520	976		350	324,250	507	51.9
MC-4	238	194,920	305	362	289,940	453	148.5	307	228,389	358	79.0
MC-5	54	43,040	67*	70	58,180	91	135.8	85	61,000	95	104.4
MC-6	90	96,200	150	216	193,940	303	202.0	195	209,275	327	107.9
MC-7	110	96,860	151	194	151,760	237	156.9	273	174,325	272	114.8
MC-8	186	171,060	267	389	280,020	438	164.0	272	134,560	210	47.9
MC-10				114	135,140	211**		48	67,450	105	49.8
AVERAGES	158	126,700	~~312~~	281	232,186	363	116.3	247	180,704	280	77.0

* 1933 Control

** Plot established 5/28/35

TABLE III

UNIT LOSSES - MODOC NATIONAL FOREST

PER SECTION BASIS

Unit	Timbered Acreage (1933)	1933 Losses Per Section Trees	1933 Losses Per Section B.M. Vol.	1933 Losses Per Unit Trees	1933 Losses Per Unit M.B.M. Vol.	1934 Losses Per Section Trees	1934 Losses Per Section B.M. Vol.	1934 Losses Per Unit Trees	1934 Losses Per Unit M.B.M. Vol.	Estimated 1935 Per Section Trees	Estimated 1935 Per Section B.M. Vol	Estimated 1935 Per Unit Trees	Estimated 1935 Per Unit MBM Vol
Glass Mtn.	53,180	264	194,880	21,800	16,170	290	177,093	24,096	14,715	199	134,173	16535	11,148
Badger	88,070	128	109,400	17,600	15,060	298	257,530	40,730	35,436	276	212,111	37978	29,186
Happy Camp	66,370	132	125,330	13,300	13,000	293	256,695	30,384	26,619	278	179,606	28829	18,625
Lava Beds	71,670	195	195,380	21,820	21,860	258	202,755	28,891	22,705	173	110,375	19373	12,360
Pit River	31,870	81	54,270	4,030	2,700	125	83,404	6,224	4,153	176	96,413	8763	4,800
Buck Creek	1,613	100	85,100	252	214	144	164,860	363	415	55	90,500	139	228
TOTALS *	312,773			78,802	69,004			130,688	104,043			111617	76,347

-214 69790

-415 103628

* Does Buck Creek totals include [illegible]

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Figure 1. Large group of ponderosa pines attacked by the first 1935 generation of the western pine beetle. This group, consisting of nearly 30 trees, was located near plot MC-3 in the Happy Camp-Lava Beds area. The three trees at the extreme left are the only green trees visible in the photo. Photo by K.A. Salman 9/1/35

Figure 2. View of Spaulding Butte near Hackamore showing groups of ponderosa pine killed by the first 1935 generation of the western pine beetle. This stand is a better site class than that shown in Figure 1. These two figures illustrate the extensive grouping characteristics of the 1935 infestation. Photo by K.A. Salman 9/1/35.

Figure 3

The infested trees shown in both figures are typical of those found on plot RS-4 near Glass Mountain. They represent the more thrifty types which are ordinarily less susceptible to insect attacks. Photos by P. C. Johnson 8/11/35

Figure 4

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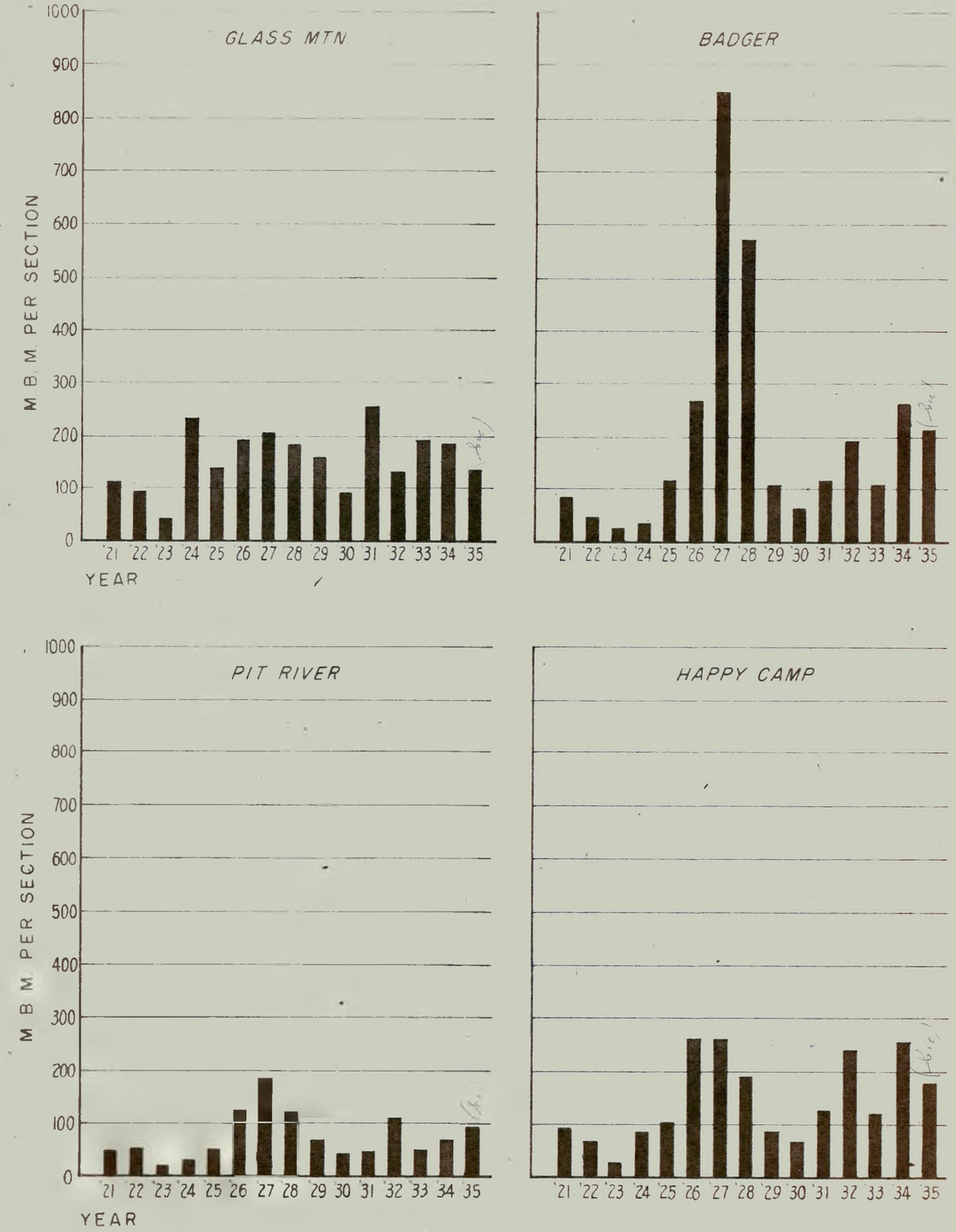
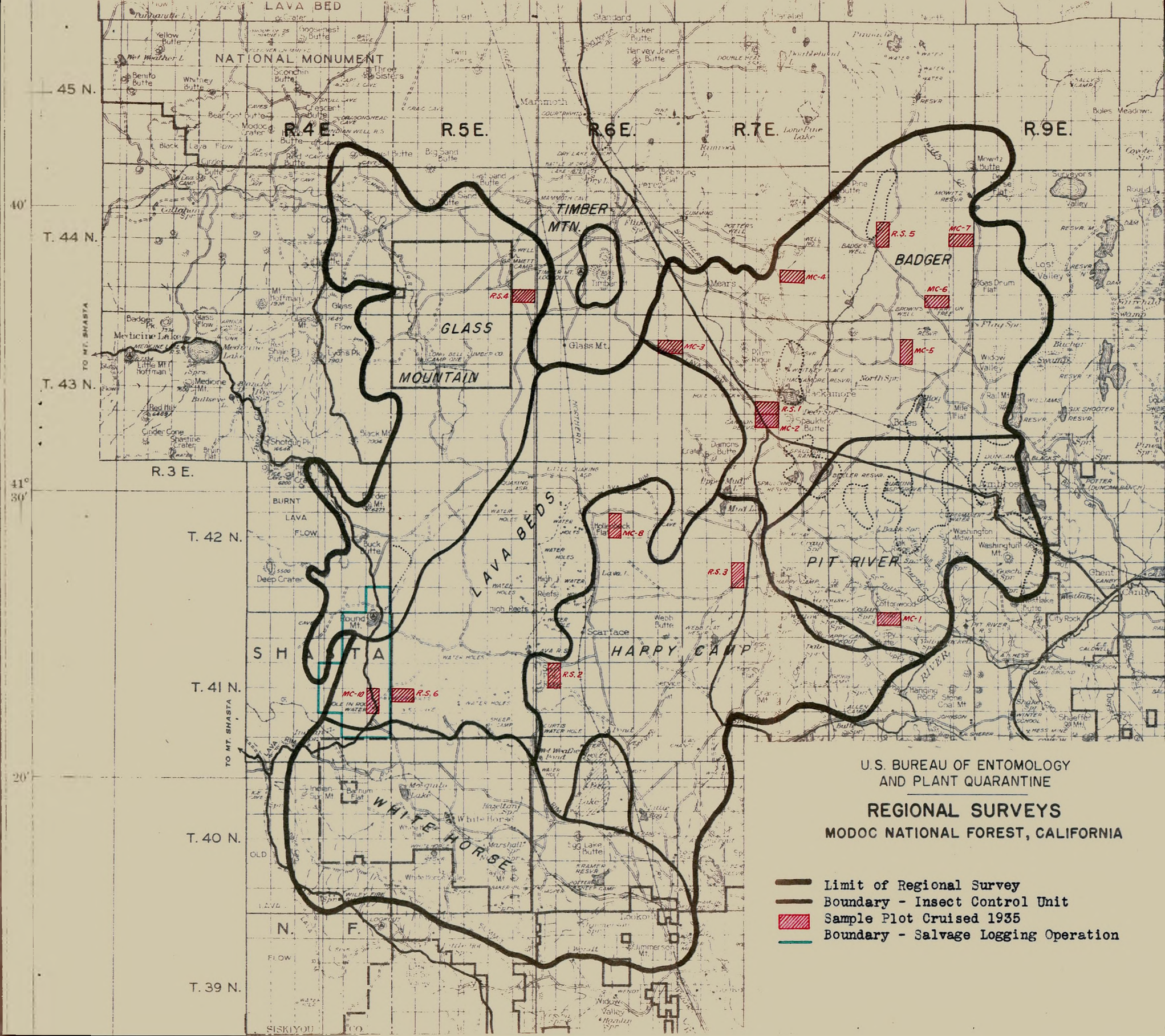
INSECT LOSSES
1921 - 1935

HAPPY CAMP - LAVA BEDS AREA
MODOC NATIONAL FOREST, CALIFORNIA

ANNUAL M.B.M. LOSS PER SECTION — BY UNITS





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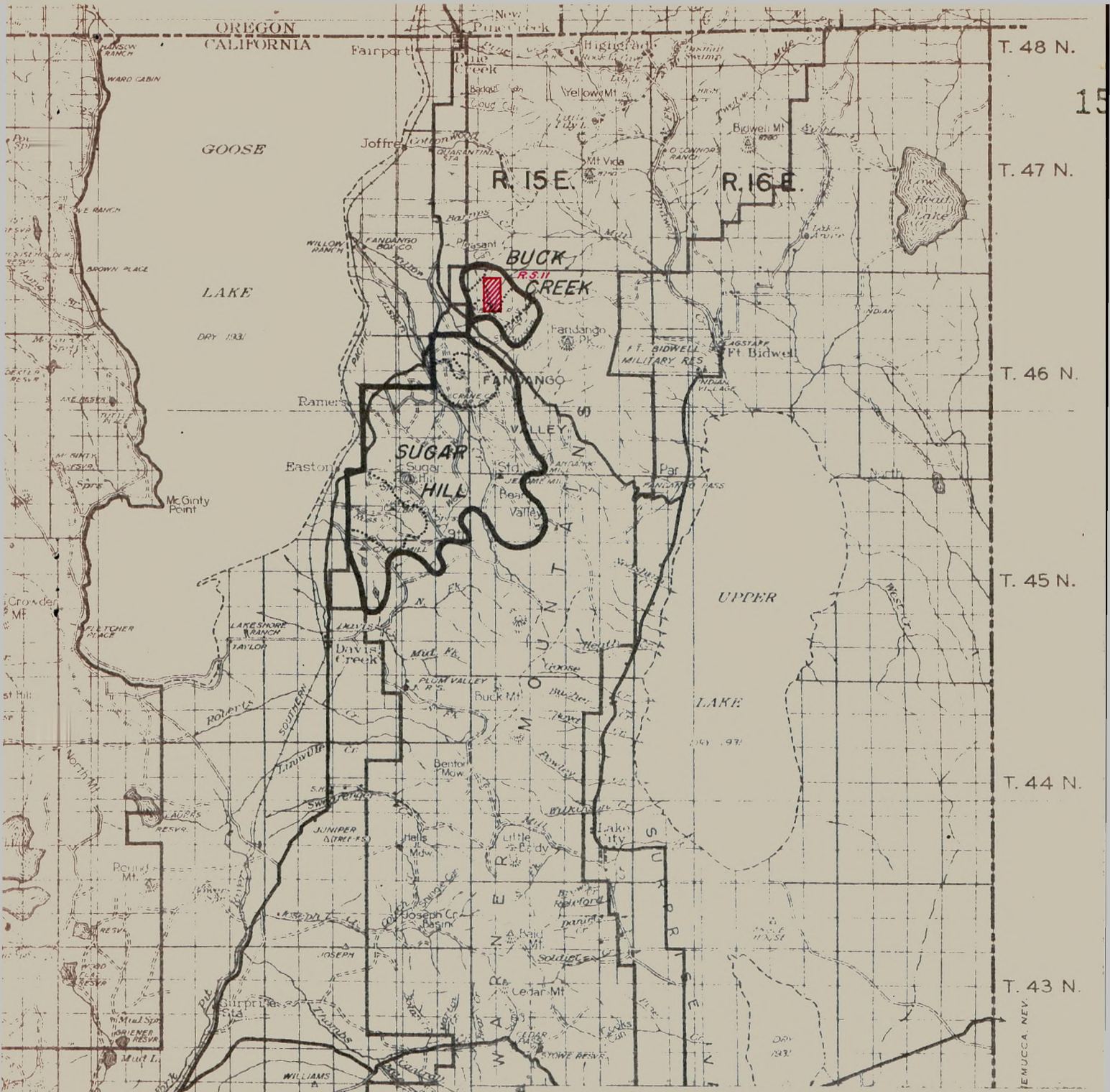
REGIONAL SURVEYS

MODOC NATIONAL FOREST, CALIFORNIA

- Limit of Regional Survey
- Boundary - Insect Control Unit
- Sample Plot Cruised 1935
- Boundary - Salvage Logging Operation



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REGIONAL SURVEYS

MODOC NATIONAL FOREST, CALIFORNIA

Boundary - Insect Control Unit

Sample Plot

A P P E N D I X

1934 Unit Losses

Glass Mountain: Cut cruise figures as follows; number of trees 50%; b.m. Volume 60%

Badger:

RS-1)
5)
MC-2)
3)
4) Average
5)
6)
7)

Happy Camp:

RS-2 x1)
3 x2) Divide by 4
MC-8 x1)

Lava Beds:

RS-6 x1)
MC-10 x1) Divide by 2 -------)
) Divide by 2
MC-8 x1) ----------)

Pit River: MC-1 x2/3

Buck Creek: RS-11 x1

1935 Unit Losses

The basis of unit estimate is the same as used for the 1934 unit estimates with the exception of the Glass Mountain unit. This is computed as follows:

Glass Mountain:

RS-4 x1)
6 x1) Divide by 2

1935 Plot Estimates

The following correction factors were used for each plot:

RS-1	60	percent	MC-1	75	percent
2	75	"	2	50	"
3	75	"	3	40	"
4	75	"	4	45	"
5	65	"	5	80	"
6	45	"	6	80	"
11	40	"	7	80	"
			8	75	"
			10	80	"